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SOUTHEASTERN COOPERATIVE WILDLIFE DISEASE STUDY

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THE UNIVERSITY OF GEORGIA
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December 8, 2003

Mr. Travis Carpenter
Hillside River National Wildlife
1562 Providence Road
Cruger, Mississippi 38924

Dear Mr. Carpenter:

Enclosed is our report on the deer population health evaluation that we conducted on Hillside National Wildlife Refuge, Holmes County, Mississippi on August 22, 2003. The health evaluations involved examination of five adult deer. The data are arranged in a series of tables (parasitologic, serologic/microbiologic/histologic, and pathologic information) and are accompanied by interpretive comments. The interpretive comments focus on the current and future status of herd health due to the two major disease problems of southeastern deer: 1) a syndrome of parasitism/malnutrition which tends to be largely dependent on deer density, and 2) hemorrhagic disease which is less clearly linked to deer density. In addition, we have conducted tests for selected diseases that are either important concerns for deer health or major domestic livestock diseases.

Our evaluation did not disclose evidence that the population is at immediate risk for future health problems from the parasitism/malnutrition syndrome, which arises from high deer density in excess of nutritional carrying capacity. Most of the animals we examined had did not have overt disease, but the relatively high APC value and the level of pathogenic large lungworms indicate that herd health due to parasitism/malnutrition syndrome could change rather rapidly should density increase markedly. Population management is appropriate for reducing these risks. In addition, the population has experienced a recent epizootic of hemorrhagic disease, a vector-borne viral disease with only limited relationship to population density. Based on serology, a high level of hemorrhagic disease activity has occurred within the last 2 years and the population currently has a high level of herd immunity. As these animals are lost from the population, the vulnerability to future hemorrhagic disease epizootics will increase as herd immunity declines. Hemorrhagic disease generally occurs at multiyear (3-5 year) intervals in this region, usually with detectable but moderate mortality. Unfortunately, there are no known management actions that are effective in preventing or reducing hemorrhagic disease activity or severity. Thus, future hemorrhagic disease epizootics are inevitable. The bloat, anemia, and synovitis in one animal appeared to be an individual animal problem and is not considered important to overall population health.

INTERPRETIVE COMMENTS: White-tailed deer collected from Hillside National Wildlife Refuge, Holmes County, Mississippi, on August 22, 2003.

Meningeal worms (*Parelaphostrongylus tenuis*), arterial worms (*Elaeophora schneideri*), large stomach worms (*Haemonchus contortus*), or liver flukes (*Fascioloides magna*) not detected in any animals. Large lungworms (*Dictyocaulus viviparus*) present at low to moderate numbers in all deer. Protostrongylid larvae, probably from muscleworms (*Parelaphostrongylus andersoni*) present in two animals. Large lungworms and protostrongylid larvae associated with mild to moderate lung damage (bronchitis/peribronchitis, pleuritis, focal pneumonia, pulmonary adhesions) in four deer. Abomasal parasites (*Mazamastrongylus odocoilei, M. pursglovei, Ostertagia dikmansi, O. mossi, Trichostrongylus askivali*) at a moderately high level (APC = 1,396) indicating that the herd likely is near the upper limit of nutritional carrying capacity. Abdominal worms (*Setaria yehi*) present at low numbers in one deer and associated with minor inflammation (peritonitis), but not considered important to herd health at the level encountered. Blood protozoans (*Theileria cervi*) present in two animals but considered a stressor only in malnourished, heavily parasitized deer. Arthropod parasites (louse flies, ticks, chiggers, nasal bots) at levels typical of many deer herds in the Southeast, but one deer had moderate inflammation and necrosis of ear tips (tick-bite dermatitis).

Physical condition ratings, kidney fat indices, and body weights were variable with most animals in relatively high condition categories and with hematologic values within normal reference ranges. One animal was in a lower condition category, was anemic, and had other pathologic conditions (see below). In addition to lesions attributable to parasitism (noted above), pathologic studies disclosed mild nonspecific inflammation of the skin (dermatitis) in one deer, and another animal had chronic inflammation of the hock joints and frothy bloat. The latter condition, usually a diet associated problem, can result in mortality of domestic ruminants but is very rare among wild white-tailed deer (no records by SCWDS). Serologic tests for antibodies to selected infectious diseases disclosed antibodies to hemorrhagic disease viruses (EHD and bluetongue) in all animals indicating a high level of viral activity within the recent past (1-2 years based on deer ages). Hemorrhagic disease is the most significant viral disease of deer and can result in varying degrees of mortality but currently the population has a high level of herd immunity resulting from this previous epizootic. Serologic tests for antibodies to the remaining infectious diseases were uniformly negative indicating minimal activity by these diseases within the population.

An overview is as follows: (1) based on APC data the herd probably is nearing nutritional carrying capacity; (2) the levels of important pathogenic parasites, especially large lungworms, are not at levels sufficient to be of immediate concern; (3) there has been a high level of hemorrhagic disease virus activity resulting in a high level of herd immunity; (4) other viral and bacterial diseases have not had high levels of activity on the area; (5) one animal was in a markedly lower health status but this was likely attributable to its very rare condition of frothy bloat; and (6) the overall health status of the herd presently is such that disease-related mortality probably is not occurring to a significant extent at the present time. However, based on the APC data and levels of large lungworms, consideration should be given to a plan to keep the herd in line with carrying capacity. An increase beyond current herd density can be expected to result in declines in herd health and higher rates of disease-induced mortality.

This was the fourth SCWDS deer health evaluation for Hillside NWR. The two earliest evaluations (1986 and 1991) disclosed somewhat higher APC values (~1,850) than did the third (1997) evaluation which had an APC value (1,328) similar to the current one. All of the evaluations detected large lungworms and frequent antibodies to hemorrhagic disease viruses but not overtly diseased animals. When viewed collectively, these four evaluations suggest that population health has been relatively stable and actually may have improved slightly over this period of time. Continued management of the population at or near current density would be compatible with maintaining herd health.

I trust this information will be of value in management of this deer population. Additional information on many of the parasites and diseases mentioned in the report can be obtained from our Field Manual of Wildlife Diseases or from our website at www.scwds.org. If you have any questions about the report, please do not hesitate to contact me.

Best regards,

Sincerely,

William R. Davidson, Ph.D.
Professor

WRD
Enclosures
CC: Mr. Pat Stinson
Mr. Sam Hamilton
Mr. Cleophas R. Cooke, Jr.
Dr. E. Frank Bowers
Mr. Larry Castle
Mr. Chad Dacus

Table 1. Arthropod, helminth, and protozoan parasites of five white-tailed deer (*Odocoileus virginianus*) collected from Hillside National Wildlife Refuge, Holmes County, Mississippi, on August 22, 2003.

Animal Number	**1**	**2**	**3**	**4**	**5**
Age (years)	6.5	2.5	2.5	1.5	6.5
Sex	F	F	F	M	F
Weight (pounds)	124	130	140	118	120
Physical Condition	G	G	E	E	F
Kidney Fat Index	41.4	70.8	50.0	25.0	6.7
Packed Cell Volume	40	46	53	44	31
Serum Protein	6.5	7.2	7.0	6.6	6.0

Arthropods

Animal Number	**1**	**2**	**3**	**4**	**5**
Lice	-	-	-	-	-
Louse Flies	Light	Light	-	Light	-
Ticks	Light	Light	Light	Moder.	Moder.
Chiggers	-	-	-	Light	-
Ear Mites	-	-	-	-	-
Nasal Bots	-	Light	Moder.	Light	-

Location in Host	**Helminths**	**Number of Parasites Per Deer** 1	2	3	4	5	**Range**	**Prevalence**	**Average**
Subcutaneous									
Brain									
Circulatory									
Lungs	Dictyocaulus viviparus	2	4	13	6	16	2-16	100%	8.2
	Protostrongylid larvae	-	+	+	-	-	-	40%	-
Abdominal Cavity	Setaria yehi	-	-	-	6	-	0-6	20%	1.2
Liver									
Esophagus									
Rumen									
Abomasum	Mazamastrongylus odocoilei	-	47	-	-	-	0-47	20%	9.4
	Mazamastrongylus pursglovei	2,340	570	1,425	368	1,353	368-2,340	100%	1,211.2
APC = (1,396)	Ostertagia dikmansi	-	-	-	-	193	0-193	20%	38.6
	Ostertagia mossi	180	95	75	92	130	75-180	100%	114.4
	Trichostrongylus askivali	-	48	-	-	64	0-64	40%	22.4
	Protozoans								
Blood	Theileria cervi	-	+	-	+	-	-	40%	-

Table 2. Results of serologic tests and microbiologic/histologic assays for selected diseases in five white-tailed deer from Hillside National Wildlife Refuge, Holmes County, Mississippi, on August 22, 2003.

Disease	Deer Number				
	1	2	3	4	5
Serologic Tests					
Leptospirosis					
(serotype bratislava)	Neg	Neg	Neg	Neg	Neg
(serotype pomona)	Neg	Neg	Neg	Neg	Neg
(serotype hardjo)	Neg	Neg	Neg	Neg	Neg
(serotype grippotyphosa)	Neg	Neg	Neg	Neg	Neg
(serotype icterohemorrhagiae)	Neg	Neg	Neg	Neg	Neg
(serotype canicola)	Neg	Neg	Neg	Neg	Neg
Brucellosis	Neg	Neg	Neg	Neg	Neg
Infectious bovine rhinotracheitis (IBR)	Neg	Neg	Neg	Neg	Neg
Bovine virus diarrhea (BVD)	Neg	Neg	Neg	Neg	Neg
Parainfluenza$_3$ (PI_3)	Neg	Neg	Neg	Neg	Neg
Epizootic hemorrhagic disease (EHD)	**Pos**	**Pos**	**Pos**	**Pos**	**Pos**
Bluetongue (BT)	**Pos**	**Pos**	**Pos**	**Pos**	**Pos**
Microbiologic/Histologic Assays					
Bovine tuberculosis[1]	Neg	Neg	Neg	Neg	Neg
Chronic wasting disease[2]	Neg	Neg	Neg	Neg	Neg

[1] Gross and microscopic examination of retropharyngeal lymph nodes.
[2] Microscopic examination for lesions (H&E) and immunohistochemistry.

Table 3. Lesions and pathologic conditions in five white-tailed deer collected from Hillside National Wildlife Refuge, Holmes County, Mississippi, on August 00, 2003.

	Deer Number				
Lesion/Condition	**1**	**2**	**3**	**4**	**5**
Bronchitis/peribronchitis	-	1	1	1	1
Fibrinous pleuritis	-	1	1	1	-
Focal verminous pneumonia	-	-	2	-	-
Pulmonary adhesions	1	1	-	-	-
Fibrinous peritonitis	-	1	-	1	-
Chronic multifocal dermatitis	-	-	1	-	1
Chronic tick-bite dermatitis (ear tip necrosis)	-	-	-	-	2
Frothy bloat	-	-	-	-	3
Chronic bilateral synovitis (hock joints)	-	-	-	-	1
Anemia	-	-	-	-	2

*Key: - = lesion or condition not present; 1 = minor tissue damage or mild pathologic change; 2 = moderate tissue damage or moderate pathologic change; 3 = extensive tissue damage or marked pathologic change.